

OPERATION MANUAL

DV-21

DIGITAL VFO



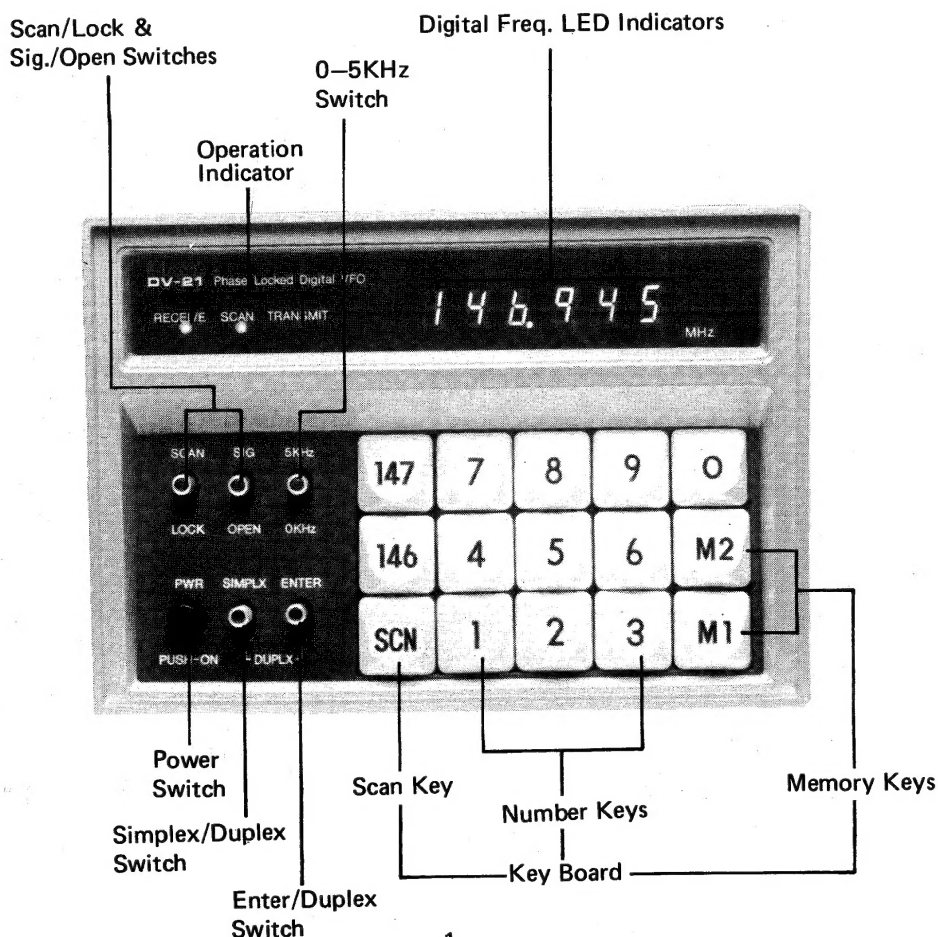
Congratulations! You have purchased one of the finest pieces of amateur equipment available anywhere in the world. You know, because it's from ICOM.

The DV-21 was designed as an exclusive external VFO for the IC-21A. It has several unique functions that will add great convenience and versatility to your transceiver. Two models of DV-21 are available. One for operation between 144-146MHz, and the other for operation between 146-148MHz. Whichever you have will allow you to operate either simplex, or duplex with any frequency split needed. The DV-21 also allows you to scan either open or used frequencies over the entire two megahertz band. Also are two memories for your favorite simplex channels.

The DV-21 employs a PLL synthesized system developed and proven by ICOM. Since the DV-21 is controlled by the PLL synthesizer, extremely high stability and reliability can be obtained.

The frequency is displayed through the use of bright easy to read LED indicators. Frequency selection is easy as pushing the numbered keys.

The more you use your DV-21, the more you will enjoy amateur radio.

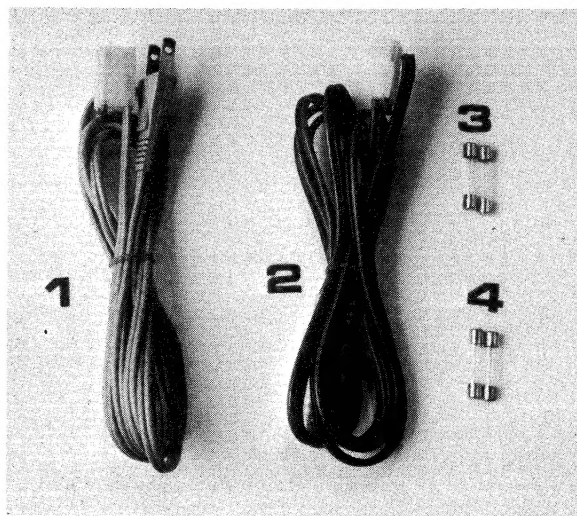


SECTION II. SPECIFICATION

Frequency Coverage	144 MHz to 146MHz or 146 MHz to 148MHz
Frequency Stability	Less than $\pm 2 \times 10^{-5}$
Number of Transistors and Diodes	Transistor 34 FET 1 I. C. 59 Diode 37
Power Supply Voltage	A.C. 100V, 117V, 200V or 230V $\pm 10\%$ D.C. 13.8V $\pm 15\%$
Power Consumption	Apprx. 20 V.A. (D.C. 1.5A)
Usable Temperature Range	0°C to 50°C
Output Frequency	For Receiving : 44.43MHz to 45.10MHz or 45.10MHz to 45.76MHz For Transmitter: 18.00MHz to 18.25MHz or 18.25MHz to 18.50MHz
Output Voltage	Apprx. 400 mV (no load)
Spurious	Less than -60 dB
Size	111 mm high X 161 mm wide X 261 mm. long
Weight	2.4 Kgs.

Accessories

(1) A.C. Cord (Grey)	1
(2) D.C. Cord (Red)	1
(3) Fuse (1A)	2
(4) Fuse (3A)	2



SECTION III. OPERATION

3-1 Connection of power cord.

Two power cords are provided as accessories for AC or DC operation. The AC cord is grey, and the DC cord is red and black. When you use a DC power supply, be sure to check the voltage in advance to be sure it is 12-15 volts. Be sure to connect the Red lead to positive (+) and the Black lead to negative (-). If a misconnection is made the built in protection circuit will cause the fuse to blow.

3-2 Connection of the DV-21 to the IC-21A

Connect the 7 pin MT type plug on the DV-21 cord into the accessory socket of the IC-21A. Sliding the cord into the space provided will allow you to place the DV-21 and IC-21A side by side.

3-3 Connection of the DV-21 to other Transceivers.

Since the output of the DV-21 is 44-45MHz for receiving and 18MHz for transmitting, the DV-21 can be used with not only the IC-21A, but also with other transceivers with the following specifications:

10.7 MHz intermediate frequency

Lower side heterodyne

multiplication factor of 8 x Basic frequency for Transmit

multiplication factor of 3 or 9 x Basic frequency for Receiving.

The transceivers need only slight modification to be able to use the DV-21. If you already own an ICOM transceiver other than an IC-21A, modify your transceiver according to the following chart. If you have a transceiver other than an ICOM, reference the chart to your sets schematic.

3-4 Operation of the DV-21 with the IC-21A

After connecting the DV-21 to the IC-21A, turn on the power switches of both sets. The receive indicator on the DV-21 will be lit and 146.00MHz or 144.000MHz, (depending on the model) will be displayed. The IC-21A will operate on the frequency shown, if the function switch is in the "EXT" on the IC-21A. At the position "AUX", "MAIN", or "DIAL", the IC-21A operates on the frequency of the channel installed in those functions, without regard to the frequency displayed on the DV-21.

The digital reading of the DV-21 will remain as shown on the front panel, however, the oscillator is in fact turned off. Therefore there is no fear of interference.

3-5 Operation of the DV-21

The DV-21 has been designed with many unique features to increase the versatility of your present transceiver.

A. Frequency selection

When first turning on your DV-21, the frequency 144.00 or 146.00MHz, depending on the model, will be displayed. If you place the 0 - 5KHz switch in the 5KHz position, a frequency of 144.005 or 146.005 will be displayed.

Frequencies are selected in the following manner. Place the 0 – 5KHz switch in the 0KHz position. Be sure the "SCAN" indicator on the display panel is not lit. If it is lit push the SCN key and the indicator should go out. Now push the appropriate Megahertz key for the frequency desired. Press the number key representing the desired 100KHz. Finally push the number key representing the desired 10KHz. If the 10KHz digit of the desired frequency is 0, there is no need to press the 0 key, as 0 is already displayed and programmed.

If you wish to operate on a frequency that has 5KHz as the final digit, program the DV-21 as described above and then place the 0 – 5KHz switch in the 5KHz position.

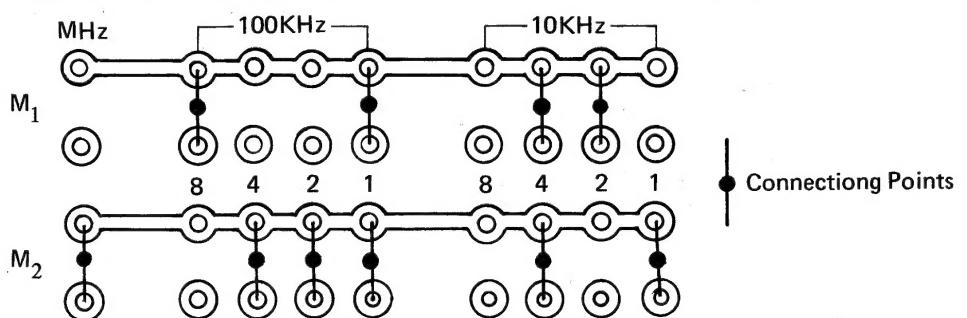
For example, if you want to operate on 146.350 first push the 146 Megahertz key, the 3 number key, and the 5 number key, and place the 0-5KHz switch in the 0 position
 $145.345 = 145 - 3 - 4 - 0$ -5KHz position.

After selecting a frequency, in order to program a new frequency, you must first press the MHz key, whether it is the same as the one displayed now or not. If the display reads 146.35 and you wish to go to 146.37, you must push 146 – 3 – 7. To change from 146.350 to 146.355 simply place the 0-5KHz switch in the 5KHz position.

Memory Frequency

The DV-21 has two programmable memories for your favorite simplex frequencies. To operate on the memory frequency all that is necessary is to push the memory key and the frequency is set and displayed of the front panel.

If you wish to change the frequency that is programmed into the memories, first remove the cover of the DV-21. On the main board towards the back, you will see a pattern similar to the one show below.



Programing the Memories.

The A and B points are for memory 1, and the C and D points are for memory 2. To program 145MHz of 147MHz (depending on the model DV-21 you have), place a jumper between the two points in the megahertz(MHz) section. To program 144MHz or 146MHz, no jumper is necessary.

Any frequency can be produced and programed into the memory by connecting the two points together corresponding to the frequency desired, according to the chart below. To program 3, 5, 7 or 9, simply connect the 2 needed points together that add up to the desired number according to the chart.

100 & 10 MHz Digits	Connecting Points			
	1	2	4	8
0				
1	○			
2		○		
3	○	○		
4			○	
5	○		○	
6		○	○	
7	○	○	○	
8				○
9	○			○

Scanning operation

The DV-21's scanning circuit is set to scan in 10KHz steps. It can scan for signals or for frequencies that are open. The scanning function can be broken down in to four areas, signal scan, open frequency scan, auto select-signal, and auto select-open frequency.

Signal Scan

Turn the SIG-OPEN switch to the SIG position the SCAN-LOCK switch to the SCAN position, and push the SCAN key. The operation indicator show the SCAN LED is lit, and the scanning starts. The scanning proceeds and will stop on a frequency that has a signal. The center meter on the IC-21A indicates zero, or near zero, and the squelch opens. The scanning will stop for a period of time, adjustable between about 3 and 20 seconds by adjusting the resistor (R57) through the hole on the top left hand side of the cover. After the time has elapsed, the scanning will continue until another signal is detected.

The scanning will not stop on frequencies that have a weak signal if the squelch control of the IC-21A is turned to deep. Be sure the squelch is adjusted for the exact threshold.

After the pause time has passed, the scanning will begin 20KHz from it's present position, since there is a possibility that the deviation of the last signal is wide enough at a certain db down from the center frequency to extend further than 10KHz. After the initial 20KHz jump, the scanning will continue in 10KHz steps. The SCAN indicator will remain lit during the pause time to show that the DV-21 is in the scan mode, and that the scanning will begin when the pause time has expired. When you want to receive continuously on the frequency that the scanning has stopped on, or to stop the scanning operation, either put the SCAN-LOCK switch in the LOCK position, or simply push the SCN key. The scan indicator goes out, and the frequency is set.

Open frequency Scan

Place the SIG—OPEN switch in the OPEN position and push the SCN key. The scan indicator will light up and the scanning begins. The scanning will stop on a frequency which has no signal, and as described above will begin after the pause time has elapsed.

Auto Select of signal frequencies

Turn the SCAN—LOCK switch to the LOCK position, the SIG—OPEN switch to the SIG position and push the scan key. The scanning indicator is lit and scanning begins. The scanning will stop on a frequency which has a signal and then scan indicator will go out.

Auto elect of open frequencies

Place the SCAN—LOCK switch in the LOCK position, the SIG—OPEN switch in the OPEN position, and push the SCN key. The same operation described above will occur, only the scanning will be released on frequencies which have no signal.

Note: The squelch adjustment is very important for correct operation of the scanning circuits. Be sure the squelch of your transceiver is adjusted very carefully for the proper squelch threshold.

DUPLEX OPERATION

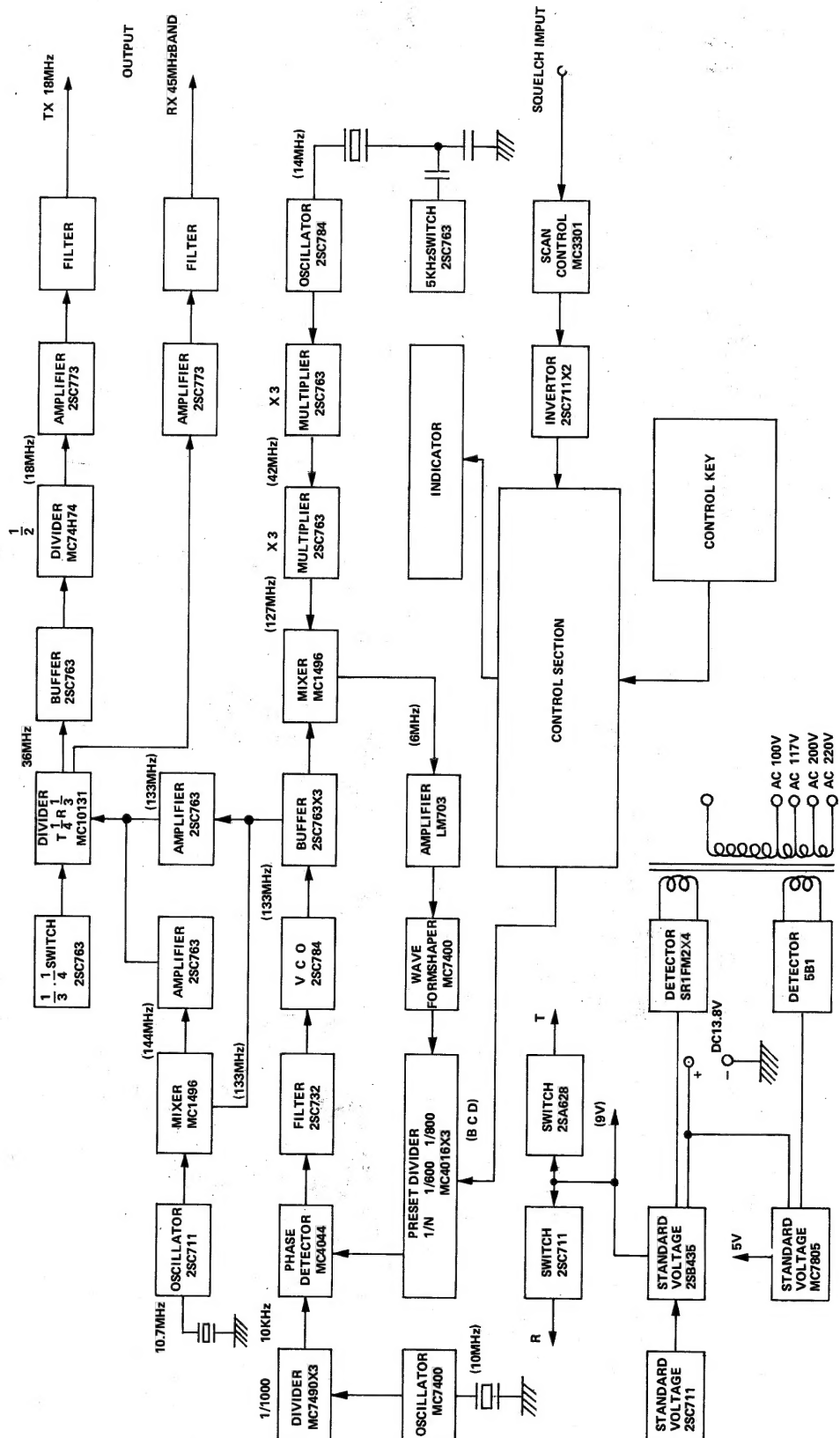
With the DV—21's exclusive frequency entering system, any frequency split or difference can be programmed by the following method.

Entering the receive frequency is the same as described before for simplex operation. However, after the frequency has been entered, place the SIMPLEX—DUPLEX switch in the DUPLEX position. With the ENTER—DUPLEX switch in the ENTER position, program the transmit frequency in the same manner as the receive frequency. Now place the ENTER—DUPLEX switch in the DUPLEX position, and the DV-21 is in the receive mode. The receive frequency will be displayed and the transceiver will receive. When the PTT switch on the microphone is pushed the transmit frequency will be displayed and the transceiver will transmit. Again when the PTT switch is released, the receive frequency will be displayed.

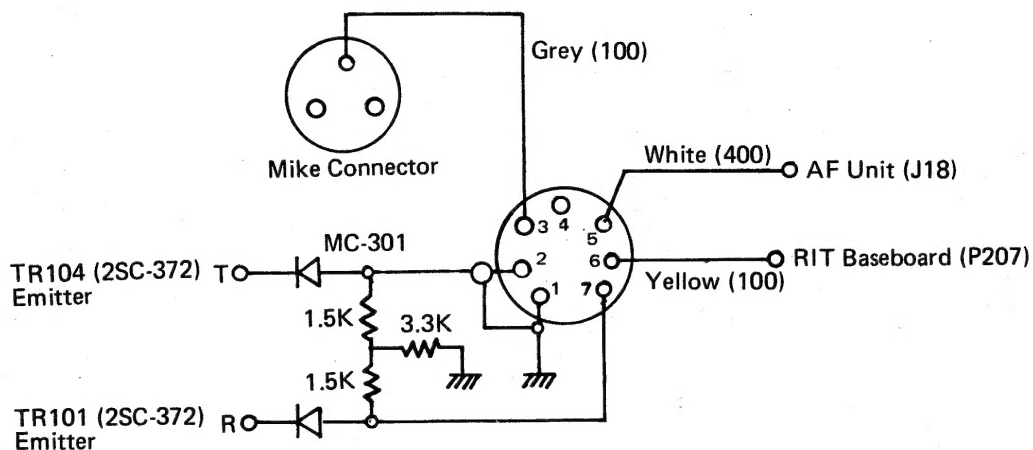
When the power switch is turned off, only the two memory frequency remain programmed.

The diagram illustrates a 100% transistor radio receiver circuit. It features a central 'CONTROL SECTION' block that manages the receiver's operation. The circuit includes several key components and stages:

- Power and Control Section:**
 - STANDARD VOLTAGE 2SC711** and **STANDARD VOLTAGE 2B9435** provide power to the **DETECTOR SR1FM2X4** and **DETECTOR 5B1**.
 - STANDARD VOLTAGE MC7805** provides a 5V supply.
 - CONTROL KEY** and **CONTROL SECTION** are interconnected.
 - INVERTOR 2SC711X2** and **SCAN CONTROL MC3301** are part of the control logic.
 - OSCILLATOR 2SC711** and **OSCILLATOR MC7400** provide timing signals.
- Frequency Conversion and Amplification Section:**
 - OSCILLATOR 2SC711** (10.7MHz) and **OSCILLATOR MC7400** (10MHz) are used for frequency conversion.
 - DIVIDER MC7490X3** (1/1000) and **DIVIDER MC10131** (1/3, 1/4) are used for frequency division.
 - MIXER MC1496** and **MIXER MC1496** are used for mixing.
 - AMPLIFIER 2SC763** and **AMPLIFIER 2SC773** provide amplification.
 - OSCILLATOR 2SC784** (14MHz) and **OSCILLATOR 2SC763** (5KHz) are used for local oscillation.
 - MULTIPLIER 2SC763** (X3) and **MULTIPLIER 2SC763** (X3) are used for frequency multiplication.
 - WAVE FORMSHAPER MC7400** and **WAVE FORMSHAPER MC7400** are used for waveform shaping.
 - PRESET DIVIDER 1/N 1/600 1/800 MC4016X3** is used for preset division.
 - PHASE DETECTOR MC1004** and **PHASE DETECTOR MC1004** are used for phase detection.
 - FILTER 2SC732** and **FILTER 2SC732** are used for filtering.
 - V C O 2SC784** and **V C O 2SC784** are used for voltage control.
 - BUCKET 2SC763X3** and **BUCKET 2SC763X3** are used for bucketing.
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Modifying other ICOM Transceivers ACC Socket to accept the DV-21 Plug



1. Disconnect all the leads of the ACC socket (7P) except the earth lead, and then bind the disconnected wires with insulating tape or similar material to avoid risk of accident. The pin 6 lead (pink) relays the power supply (9V) of the R.OSC circuit, and so should be spliced or connected with tape to maintain this supply even after the lead has been detached from the socket.
2. Solder the cathode of one diode MC301 to the pin (emitter side) of the emitter resistor (R118-470 Ω) of SR 104 (2SC-372) in the T.OSC circuit, and connect the anode side to the coaxial line. Connect the earth lead to the coil LS-2 case. (cover diode MC-301 with a plastic sleeve). Connect the other side of the coaxial line to socket pin 1 and 2.
3. Similarly, connect the anode of the other MC-301 directly to socket pin 7 and solder the cathode to the pin of the emitter resistor (R103-470 Ω) of TR101 (2SC-372) in the R.OSC circuit.
4. Connect each socket pin 2, 7 via a 1.5 K resistor to terminal or 3 or 4 of the 6P terminal strip; then connect the 3.3 K resistor to terminal 1 or 6 of the terminal strip.
5. Insert a 1.5 K resistor between socket pins 2, 7 and terminals 3, 4 of the terminals and terminal 1, 6 of the terminal strip.
6. Connect socket pin 3 with the grey lead to the MIC connector (stand-by SW).
7. Connect socket pin 5 with the white lead to the collector of TR707 (2SC-372) in the AF unit (J18)
8. Connect socket pin 6 with the yellow lead to RIT baseboard P207 (solder the lead to the baseboard pin).